

3/9/16 "I make the most of all that comes and the least of all that goes."-Sara Teasdale

HW: "Function Notation" homework section #1, 3, 5  
Test 2 on Tuesday 3/15

AIM: What is Function Notation?

Warm Up:

**Exercise #1:** Evaluate each of the following given the function definitions and input values.

rule

(a)  $f(x) = 5x - 2$

$$f(3) = 5(3) - 2 = 15 - 2 = \boxed{13}$$

$$f(-2) = 5(-2) - 2 = -10 - 2 = \boxed{-12}$$

(b)  $g(x) = x^2 + 4$

$$g(3) = 3^2 + 4 = 9 + 4 = \boxed{13}$$

$$g(0) = 0^2 + 4 = 0 + 4 = \boxed{4}$$

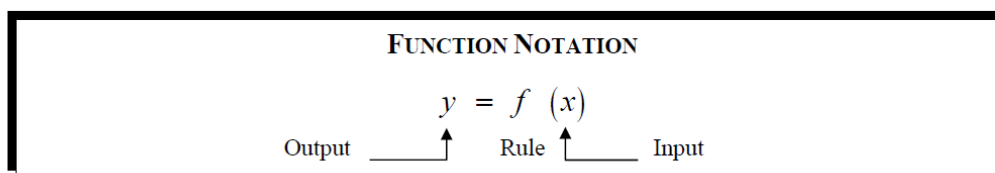
function "g"  
using  $x$  as  
input

(c)  $h(x) = 2^x$

$$h(3) = 2^3 = \boxed{8}$$

$$h(-2) = 2^{(-2)} = \frac{1}{2^2} = \boxed{\frac{1}{4}}$$

Although this notation could be confused with multiplication, the context will make it clear that it is not. The idea of function notation is summarized below.



**Exercise #2:** Boiling water at 212 degrees Fahrenheit is left in a room that is at 65 degrees Fahrenheit and begins to cool. Temperature readings are taken each hour and are given in the table below. In this scenario, the temperature,  $T$ , is a function of the number of hours,  $h$ .

<i>input</i> $h$ (hours)	0	1	2	3	4	5	6	7	8
<i>output</i> $T(h)$ ( $^{\circ}F$ )	212	141	104	85	76	70	68	66	65

(a) Evaluate  $T(2)$  and  $T(6)$ .

Temperature  
@ hour 2

$$T(2) = 104^{\circ}$$

$$T(6) = 68^{\circ}$$

(b) For what value of  $h$  is  $T(h) = 76$ ?

What hour is the temp.  $76^{\circ}$ ?

$$h = 4$$

(c) Between what two consecutive hours will  $T(h) = 100$ ?

@ what time is the temp  $100^{\circ}$ ?

@ hour 2 the temp is 104

@ hour 3 the temp is 85

So sometime between hour 2 and hour 3 the temp was 100.

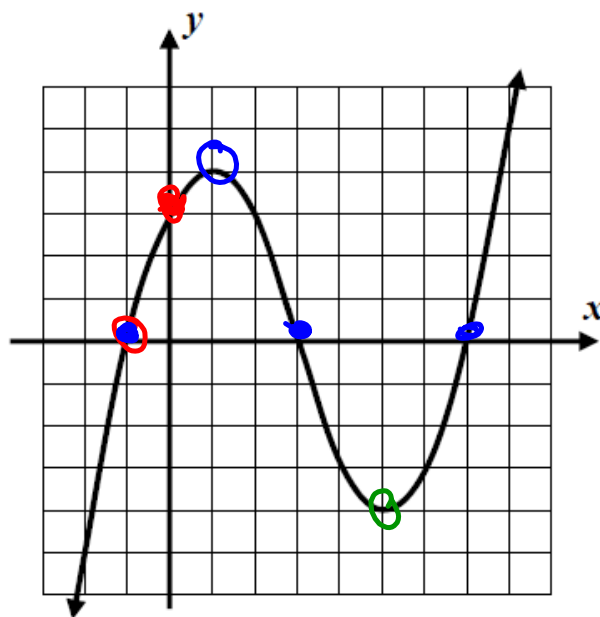
**Exercise #3:** The function  $y = f(x)$  is defined by the graph shown below. Answer the following questions based on this graph.

- (a) Evaluate  $f(-1)$ ,  $f(1)$ , and  $f(5)$ .

$f(-1) \rightarrow$  what is "y" when  $x = -1$ ?  $f(-1) = 0$

$f(1) = 4$

$f(5) = -4$



- (b) Evaluate  $f(0)$ . What special feature on a graph does  $f(0)$  always correspond to?

$f(0) = 3$

which means the point  $(0, 3)$   
(y-intercept)

- (c) What values of  $x$  solve the equation  $f(x) = 0$ ?

What special features on a graph does the set of  $x$ -values that solve  $f(x) = 0$  correspond to?

$x = -1, 3, 7$

roots, zeros, solutions

what  $x$ -value gives me 0 as a "y"?

- (d) Between what two consecutive integers does the largest solution to  $f(x) = 3$  lie?

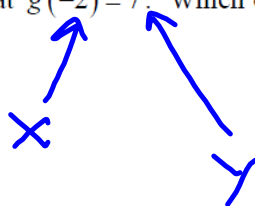
**Exercise #4:** For a function  $y = g(x)$  it is known that  $g(-2) = 7$ . Which of the following points must lie on the graph of  $g(x)$ ?

(1)  $(7, -2)$

(3)  $(0, 7)$

(2)  $(-2, 7)$

(4)  $(-2, 0)$



**Exercise #5:** Physics students drop a ball from the top of a 50 foot high building and model its height as a function of time with the equation  $h(t) = 50 - 16t^2$ . Using TABLES on your calculator, determine, to the nearest tenth of a second, when the ball hits the ground. Provide tabular outputs to support your answer.

one decimal  $y = 50 - 16x^2$

we want to know when height is 0.

$$X = 1.8 \text{ seconds}$$

$$\Delta \text{Table} = .1$$

## FLUENCY

1. Without using your calculator, evaluate each of the following given the function definitions and input values.

(a)  $f(x) = 3x + 7$

$f(-4) = -5$

$f(2) = 13$

(b)  $g(x) = 3x^2$

$g(2) = 12$

$g(-3) = 27$

(c)  $h(x) = \sqrt{x-5}$

$h(41) = 6$

$h(14) = 3$

2. Using STORE on your calculator, evaluate each of the following more complex functions.

(a)  $f(x) = \frac{3x^2 - 5}{4x + 10}$

$f(-5) =$

$f(0) =$

(b)  $g(x) = \frac{\sqrt{25-x^2}}{x}$

$g(4) =$

$g(-3) =$

(c)  $h(x) = 30(1.2)^x$

$h(3) =$

$h(0) =$

3. Based on the graph of the function  $y = g(x)$  shown below, answer the following questions.

- (a) Evaluate  $g(-2)$ ,  $g(0)$ ,  $g(3)$  and  $g(7)$ .

$g(-2) = -3$

$g(0) = -3$

$g(3) = 4$

$g(7) = 0$

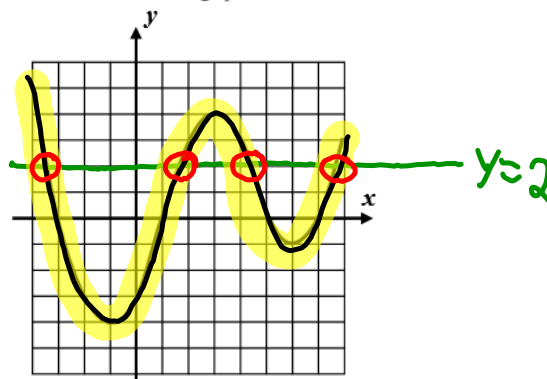
- (b) What values of  $x$  solve the equation  $g(x) = 0$

$-3, 1, 5, 7$

- (c) Graph the horizontal line  $y = 2$  on the grid above and label.

- (d) How many values of  $x$  solve the equation  $g(x) = 2$ ?

$4 \text{ values}$



## APPLICATIONS

4. Ian invested \$2500 in an investment vehicle that is guaranteed to earn 4% interest compounded yearly. The amount of money,  $A$ , in his account as a function of the number of years,  $t$ , since creating the account is given by the equation  $A(t) = 2500(1.04)^t$ .

(a) Evaluate  $A(0)$  and  $A(10)$ .

(b) What do the two values that you found in part (a) represent?

(c) Using tables on your calculator, determine, to the nearest whole year, the value of  $t$  that solves the equation  $A(t) = 5000$ . Justify your answer with numerical evidence.

(d) What does the value of  $t$  that you found in part (b) represent about Ian's investment?

5. A ball is shot from an air-cannon at an angle of  $45^\circ$  with the horizon. It travels along a path given by the equation  $h(d) = -\frac{1}{50}d^2 + d$ , where  $h$  represents the ball's height above the ground and  $d$  represents the distance the ball has traveled horizontally. Using your calculator to generate a table of values, graph this function for all values of  $d$  on the interval  $0 \leq d \leq 50$ . Look at the table to properly scale the y-axis.

What is the maximum height that the ball reaches? At what value of  $d$  does it reach this height?

max height = 12.5  
when  $x = 25$

